

Lecture Module - Electrical Instruments

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

Topic 1 - Electrical Instruments

Module 1 - Electrical Instruments

- Topic 1 - Performing Analog Measurements
- Topic 2 - Building Prototype Circuits
- Topic 3 - Time Varying Signals
- Topic 4 - Oscilloscope Troubleshooting

Topic 1 - Performing Analog Measurements

- Safety and Electricity
- Using a Digital Multimeter
- Measuring Voltage and Current
- Measuring Resistance and Continuity

Safety and Electricity

Complete the safety training modules to learn more.

Using a Digital Multimeter

Benchtop Multimeter

- DMM
- Interface varies by manufacturer
- Features vary by model



Image: Bk Precision Multimeter

Using a Digital Multimeter

Handheld Multimeter



Image: [Digital Multimeter - Wikimedia Commons](#)



Image: [Fluke 115 - Wikimedia Commons](#)



Image: [Clampmeter 337 - Wikimedia Commons](#)

Measuring Voltage and Current

Voltage



Image: Bk Precision Multimeter

[Read about measuring DC voltage](#)
[or AC voltage](#)

Measuring Voltage and Current

Current



Image: Bk Precision Multimeter

[Read about measuring current \(with clamp\)](#)

Measuring Resistance and Continuity

Resistance



Image: Bk Precision Multimeter

[Read about measuring resistance](#)

Measuring Resistance and Continuity

Continuity



Image: Bk Precision Multimeter

[Read about measuring continuity](#)

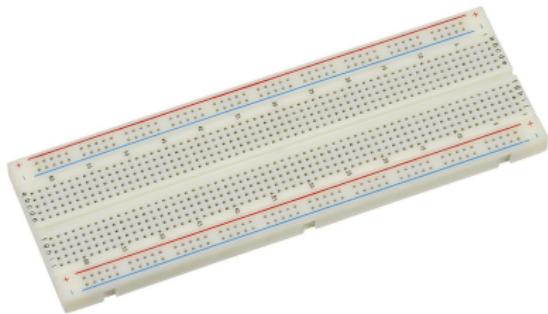
Topic 2 - Building Prototype Circuits

- Circuits for Mechanical Engineers
- Using a Solderless Breadboard
- Using a Desktop Power Supply
- Examples

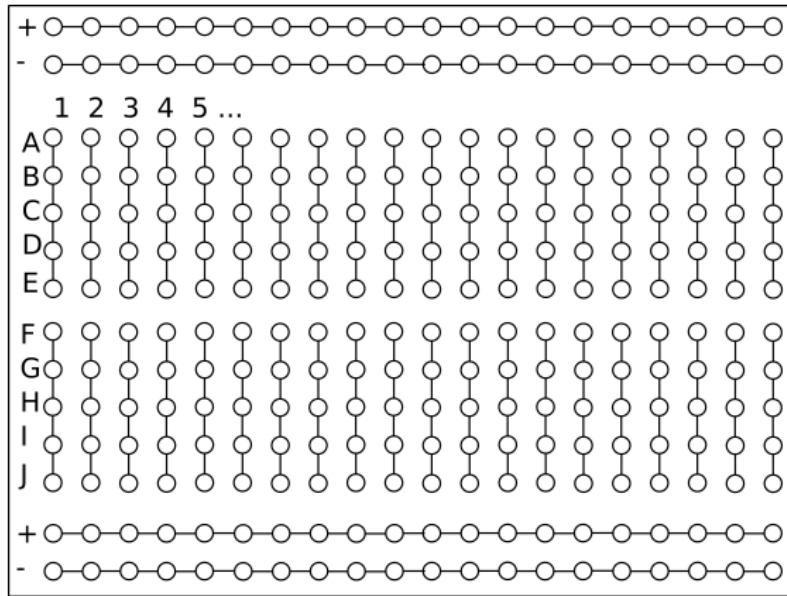
Circuits for Mechanical Engineers

Engineering is an integrated field...

Using a Solderless Breadboard



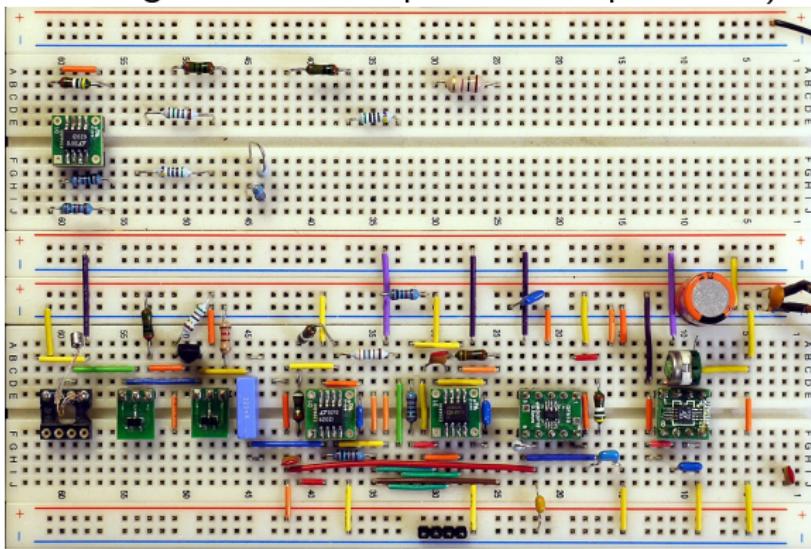
Using a Solderless Breadboard



Using a Solderless Breadboard

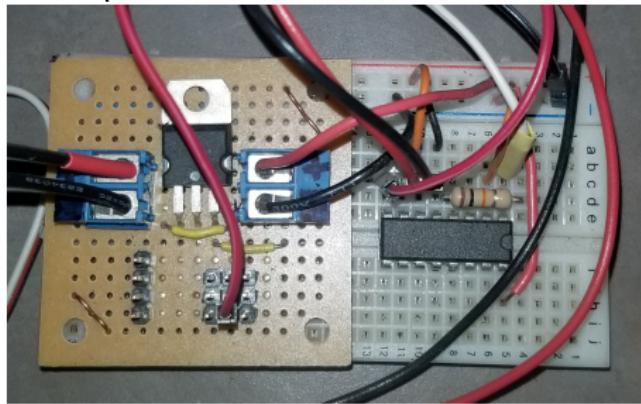
Example 1:

Question: Why is the breadboard separated into sections? (note: this image shows 4 - top, bottom,top,bottom)



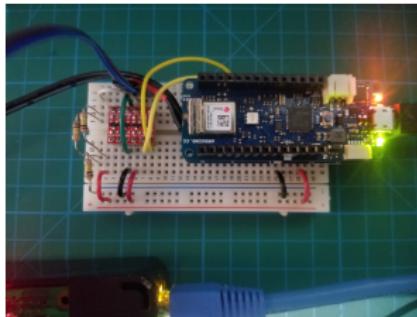
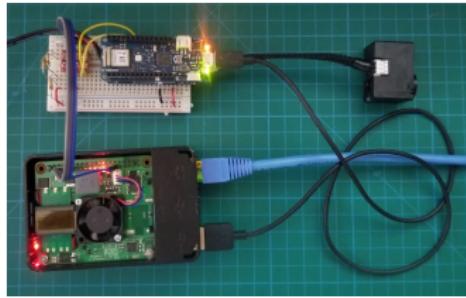
Using a Solderless Breadboard

Example 2:



Using a Solderless Breadboard

Example 3:



Using a Solderless Breadboard

Pros:

Cons:

Common Mistakes:

Using a Desktop Power Supply



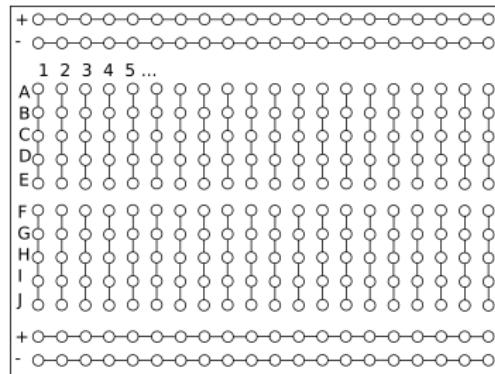
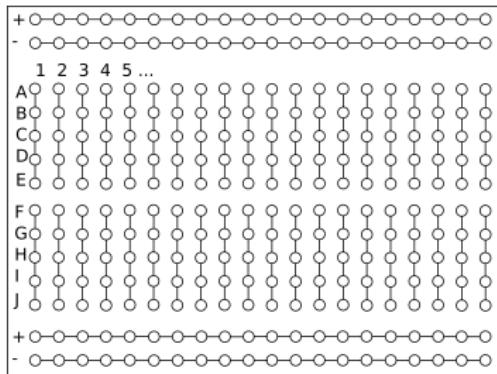
Using a Desktop Power Supply



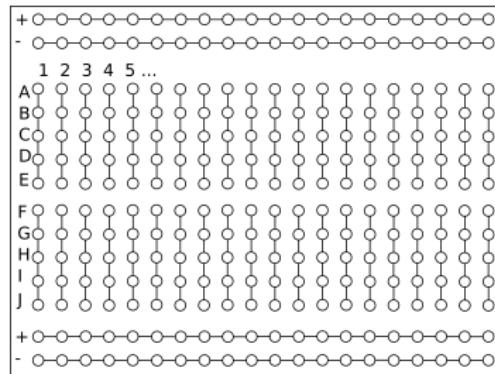
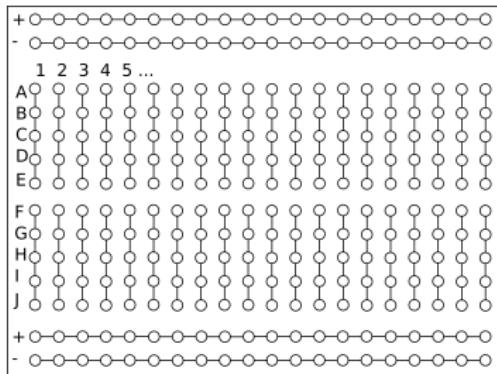
Using a Desktop Power Supply

- - Equipment Safety
- - Damage
- - Protection

Examples



Examples



Topic 3 - Time Varying Signals

- Using a Function Generator
- Using an Oscilloscope
- Pros, Cons, and Pitfalls
- Activity

Performing Analog Measurements
Building Prototype Circuits
Time Varying Signals

Using a Function Generator
Using an Oscilloscope
Using an Oscilloscope
Activity

Using a Function Generator

Using an Oscilloscope

Text: Theory and Design of Mech. Meas.

Pros, Cons, and Pitfalls

Text: Theory and Design of Mech. Meas.

Performing Analog Measurements
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Time Varying Signals

Using a Function Generator
Using an Oscilloscope
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Activity